

Dear Editor and authors,

According to the authors' revision, I make my comments as the following.

General comments

This work, at least, in its current form is unacceptable. I believe that three main points are needed to be solved to consider the manuscript for publication. First, a considerable English improvement should be made. There are many language issues which make the manuscript hard to be reviewed. Second, a deep restructure of the paper should be considered, particularly for introduction. The motivation and novelty of the paper are still unclear. In introduction, the authors use a lot of words to present the classifications of methods to identify contaminant source, while only few sentences are prepared for the Bayesian global optimization approach. Moreover, it is better that authors can classify reasons why the use of Bayesian global optimization is more attractive in comparison to its alternatives in the introduction, right? Third, authors should add some comparisons of efficiency and effectiveness between different methods tested. To show the settings can be used as a benchmark, this point is important. In this case, authors can move the sensitivity analyses of optimization results to the number of measurements and the magnitude of the observation error into a supplementary. Specific comments are given below.

Specific comments

- Line 2 page 1: specify that you use deterministic hydraulic conductivity fields, right?
- Line 6 page 1: please be very careful of the use of 'benchmark', because only one approach is used in the paper which didn't show reader that such settings can tell the abilities and inabilities of some existed alternatives. It is unclear that such settings can be used as a benchmark or not.
- Lines 4-7 page 2: please rephrase this sentence
- Line 28 page 2: please check the terminology "Parameter models"
- Line 4 page 2: please add references respectively after "homogeneous" and "multi-Gaussian"
- Lines 3-8 page 2: be very careful of these sentences. It should be very clear that why the geological medium you use is more proper than the others, for example, the multi-Gaussian like random field? I mean you should provide more related details. In addition, I believe that the use of "realistic" may be improper.
- Line 10-11 page 3: please rephrase this sentence and check the terminology "simulated measurements"
- Lines 20-23 page 3: please rephrase this sentence
- Lines 32-34 page 3: again, at least now, you can't say that the settings can be used as a benchmark to tell which optimization method is better, right?
- Line 4: replace "model" with "aquifer" or "field of hydraulic conductivity"?
- Lines 4-6: the synthetic aquifer is used to simulate the braided-river aquifer. You should declare this early, right after Line 8 page 2.
- Lines 8-12: please rephrase these sentences.

Lines 17-20: check the punctuations

Introduction: can you trim the text for classifying the methods to identify contaminant source characteristics? And it would be better that more text concerning Bayesian global optimization is specified, especially, why you choose this approach?

Line 26 page 4: What is MPS? You should say it is multi-point statistics.

Lines 27-29: this sentence is unclear. What do you mean by “contaminant spreading is mainly modeled by the explicit description of geological heterogeneity”? the logic of this sentence is incorrect. I can’t understand why “longitudinal dispersivity is taken as the smallest possible value with the grid size” is attributed to “contaminant spreading is mainly modeled by the explicit description of geological heterogeneity”? Additionally, what do authors mean by “the smallest possible value”? Please be clear.

Algorithm 1: please specify that $N = 100$ and $n_0 = 9$, right? You also need to tell the reader what are n , n_0 and N ? Please be clear.

Line 10 page 8: as you now take the measurement errors into account, the minimum of this function may not equal to 0.

Line 10 page 8: “which corresponds to an l^p norm.” is unclear. Please rephrase it. You mean the l^p norm of what? Please be clear. Furthermore, replace “an” with “the”.

Line 4 page 10: K should be in bold, because it is a symbol indicating a matrix. Please check this issue throughout the manuscript.

Equation (2): What’s “ p ”?

Line 5 page 9: please add references for “machine learning”

Line 16 page 9: please add references for “Gaussian Processes”

Lines 17-19 page 10: remove “First” and rephrase this sentence

Line 25 page 10: the l^2 norm of what?

Lines 8-10 page 12: please rephrase this sentence

Line 11 page 12: what do you mean by “replications”? Please check this terminology.

Line 12 page 12: Please rephrase this sentence.

Line 15 page 12: what do you mean by “true minimum”

Lines 12-13 page 16: rephrase this sentence.

Line 16 page 16: I didn’t find where you show the results you mention. And, what do it mean by “for l^1 norm objective functions”?

Lines 35-37 page 17: Please rephrase this sentence

Lines 13-15 page 17: Please rephrase these sentences

Editorial comments

Line 6 page 1: replace “or” with “and”

Line 20 page 1: classified

Line 22 page 1: replace “are” with “is” and check this throughout the manuscript

Line 14 page 2: remove “as defined above”

Line 32 page 2: contains

Line 17 page 3: remove “A”

Line 3 page 7: replace “the figure” with Figure 3

Line 6 page 8: is denoted as

Line 20 page 8: contaminant source identification problem

Line 19 page 10: analyses

The first line page 12: the explorations of the objective functions

Line 5 page 12: the explored locations

Line 7 page 12: replace “&” with “and”

Line 16 page 12: Figures 6A to D?

Line 18 page 12: Figures 6E to H?